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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/077,211      | 02/14/2002  | Richard J. Nathan    | M-12562 US          | 3098             |

34036 7590 07/01/2003

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EXAMINER

ZARNEKE, DAVID A

ART UNIT PAPER NUMBER

2827

DATE MAILED: 07/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/077,211

Applicant(s)

NATHAN ET AL.

Examiner

David A. Zarneke

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8 and 18-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 18-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2/14/02 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO 892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

Applicant's election without traverse of claims 1-8 and 18-29 is acknowledged.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-8 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Mahulikar, US Patent 5,629,835.

Mahulikar teaches a BGA package comprising:

a substrate (62) formed of a heat deformable material, such as a metal, polymer or ceramic (6, 50+);

at least one semiconductor die (54) embedded in said substrate such that the top surface(s) of said at least one semiconductor die and the top surface of said substrate are in substantially the same plane;

a plurality of bonding pads formed on the top surface(s) of said at least one die;

and a plurality of conductive paths (66) formed over the top surface(s) of said at least one die and the top surface of said substrate, each conductive path ending

on the top surface of said substrate in a conductive land or pad and beginning in electrical contact, using a bond wire (58), with a corresponding bonding pad on said at least one die thereby to connect said corresponding bonding pad on the top surface(s) of said at least one die with a corresponding conductive land or pad on the top surface of said substrate (Figure 9).

Regarding claims 2-4, Mahulikar teaches the use of solder balls (70) to attach the lands of the package to contacts on a PCB (92), the PCB inherently having conductive traces connected to said electrical contacts thereby to allow electrical signals to be sent from said at least one die to circuitry external to said at least one die and to also allow electrical signals to be sent from circuitry external to said at least one die to said at least one die.

With respect to claims 5 and 6, Mahulikar teaches depositing a potting compound (60) over the die that can be made of silicone (6, 16+), which is known to be a moisture-resistant plastic.

As to claim 7, Mahulikar teaches the potting compound as covering some of the substrate surface (Figure 9). The term "covers" does not inherently imply complete coverage, only that some of the surface is covered.

Regarding claim 8, Mahulikar teaches a substrate having bond pads on its bottom side and vias through the substrate connecting bond pads on the top surface with bond pads on the top side (Figures 15-18).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 18-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mahulikar et al., US Patent 5,629,835, as applied to claim 1 above, and further in view of Hamburger et al., US Patent 5,776,800.

Regarding claim 18, Mahulikar fails to teach forming a conductive plane over the top of the die, wherein the plane is electrically insulated from the bonding pads of the die.

Hamburger teaches a metallic stress relieving insert (43) formed over the top of the die and electrically insulated from the bonding pads of the die (figure 10).

It would have been obvious to one of ordinary skill in the art to use the metallic stress relieving insert of Hamburger in the invention of Mahulikar because the metallic stress relieving insert relieves thermal and mechanical stresses.

With respect to claim 19, Mahulikar fails to teach forming a conductive plane over the top of the die in a region interior to the bonding pads of the die.

Hamburger teaches a metallic stress relieving insert (43) formed over the top of the die and interior to the bonding pads of the die (figure 10).

It would have been obvious to one of ordinary skill in the art to use the metallic stress relieving insert of Hamburger in the invention of Mahulikar because the metallic

stress relieving insert relieves thermal and mechanical stresses without taking up much space.

As to claims 20 and 21, Hamburg teaches electrically connecting the plane to bumps on the chip to act as a chip capacitor (figure 11).

It would have been obvious to one of ordinary skill in the art to use the chip capacitor of Hamburg in the invention of Mahulikar because Hamburg teaches that the chip capacitor stabilizes the power supply (5, 55+).

Regarding claim 22, while Hamburg fails to teach forming an isolative protective coating over the plane, it is conventionally known to one of ordinary skill in the art to bury the insert of Hamburg because the exposed surface of the insert would then be protected from the environment.

The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

With respect to claims 23 and 24, the protective coating having openings therein and conductive materials deposited into these openings so as to provide electrical connection and attachment to an external heat sink.

The forming of openings having conductive materials therein to provide connection to the plane and to provide attachment to an external heat sink is conventionally known in the art.

The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

As to claims 25-27, the use of a bottom conductive plane that is electrically connected to a source of potential such as ground and power.

The use of a bottom plane that is electrically connected a ground or power supply is conventionally known in the art.

The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

### ***Allowable Subject Matter***

The concept of "embedding" the die in the heat deformable material so that the top of the die is coplanar with the top of the substrate as intended by the specification is novel. But, the language used in the claims does not clearly and specifically teach away from the rejections cited above.

While the examiner currently does not have a satisfactory suggestion for allowable language, I am certain that such language can be found.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nakatani et al., US Patents 6,338,767, and 6,038,133 both teach embedding a die in a thermosetting resin, but not such that the die is coplanar with the edge of the resin.

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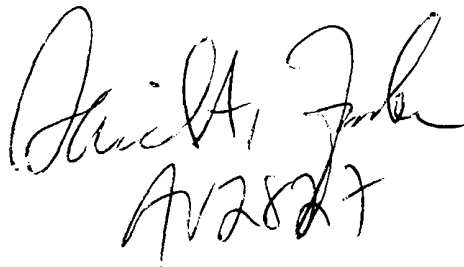
Wills et al., US Patent 5,406,116, and James, US Patent 3,518,494, both teach conductive planes within the interior of the bond pads of the die and connected to ground or power potentials.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (703)-305-3926. The examiner can normally be reached on M-F 10AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Talbott can be reached on (703)-305-9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-308-7722 for regular communications and (703)-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

David A. Zarneke  
June 25, 2003



David A. Zarneke  
AV2827